



UNITED STATES PATENT AND TRADEMARK OFFICE

UNITED STATES DEPARTMENT OF COMMERCE
United States Patent and Trademark Office
Address: COMMISSIONER FOR PATENTS
P.O. Box 1450
Alexandria, Virginia 22313-1450
www.uspto.gov

APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/632,628	08/01/2003	Bradley J. Howard	2269-5862US (02-1563.00/	4766
24247	7590	08/02/2007	EXAMINER	
TRASK BRITT			DHINGRA, RAKESH KUMAR	
P.O. BOX 2550				
SALT LAKE CITY, UT 84110				
			ART UNIT	PAPER NUMBER
			1763	
			MAIL DATE	DELIVERY MODE
			08/02/2007	PAPER

Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

Office Action Summary	Application No. 10/632,628	Applicant(s) HOWARD, BRADLEY J.	
	Examiner Rakesh K. Dhingra	Art Unit 1763	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --
Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 03 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on 5/22/07.
- 2a) ☒ This action is **FINAL**. 2b) ☐ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 1,3-9 and 11-23 is/are pending in the application.
- 4a) Of the above claim(s) _____ is/are withdrawn from consideration.
- 5) ☐ Claim(s) _____ is/are allowed.
- 6) ☒ Claim(s) 1,3-9 and 11-23 is/are rejected.
- 7) ☐ Claim(s) _____ is/are objected to.
- 8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☒ The drawing(s) filed on 28 November 2003 is/are: a) ☒ accepted or b) ☐ objected to by the Examiner.
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some * c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
 2. ☐ Certified copies of the priority documents have been received in Application No. _____.
 3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

- | | |
|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <p>1) <input checked="" type="checkbox"/> Notice of References Cited (PTO-892)</p> <p>2) <input type="checkbox"/> Notice of Draftsperson's Patent Drawing Review (PTO-948)</p> <p>3) <input type="checkbox"/> Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08)
 Paper No(s)/Mail Date _____.</p> | <p>4) <input type="checkbox"/> Interview Summary (PTO-413)
 Paper No(s)/Mail Date. _____.</p> <p>5) <input type="checkbox"/> Notice of Informal Patent Application (PTO-152)</p> <p>6) <input type="checkbox"/> Other: _____.</p> |
|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|

Art Unit: 1763

DETAILED ACTION

Response to Arguments

Applicant's arguments with respect to claims 1, 3-9, and 11-23 have been considered but are moot in view of the new ground(s) of rejection as explained hereunder.

Applicant has amended claims 1, 16 by adding new limitation "for supporting a wafer thereon".

Accordingly claims 1, 3-9 and 11-23 are now pending and active.

New reference (US PG PUB No. 2004/0025791 – Chen et al) when combined with Tsuchiya et al reads on amended claims 1, 16 limitations. Accordingly independent claims 1, 16 and dependent claims 3-9, 11-15 and 17-23 have been rejected under 35 USC 103 (a) as explained below.

Claim Rejections - 35 USC § 103

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

Claims 1, 3-9, 11-23 are rejected under 35 U.S.C. 103(a) as being unpatentable over Tsuchiya et al (US Patent No. 5,716,534) in view of Chen et al (US PG PUB No. 2004/0025791).

Regarding Claims 1, 16, 17: Tsuchiya et al teach a plasma apparatus (Figures 1, 30-33) comprising a first and second frequency based power generators 29, 18 connected to electrodes 21 (upper electrode) and 4 (lower electrode) respectively. Tsuchiya et al further teach a CPU (controller) 20 that can be configured to selectively control the activation configuration (in a step manner or continuously

Art Unit: 1763

varying) of first and second power generators 29,18 during duty cycle of a process to enable optimize the etching process (column 4, line 45 to column 6, line 45 and column 12, line 5 to column 13, line 35).

Tsuchiya et al do not teach a third frequency based power generator coupled to lower electrode.

Chen et al teach a plasma etching apparatus (Figure 1) comprising:

first, second and third power generators 162, 150, 154 wherein the first power generator 162 is coupled to an upper electrode 174 and the second and third power generators 150, 154 are coupled to a lower electrode 120 for supporting a wafer thereon, the first, second and third power generators being frequency- based power generators; and where the second and third generators 150, 154 enable to supply a modulated bias signal to lower electrode 120 to provide improved selectivity and increased process window.

a controller 110 configured to control the three frequency based power generators as per process limitations like plasma density, size of wafer etc (paragraphs 0018-0035).

It would be obvious to configure the controller to selectively control the activation configuration of all the three generators with modulated bias applied to lower electrode in view of teachings of Tsuchiya et al and Chen et al, to optimize the etching process with improved selectivity and increased process window.

Therefore it would have been obvious to one of ordinary skill in the art at the time of the invention to configure the controller of Tsuchiya et al so as to selectively activate the first, second and third power generators as taught by Chen et al to achieve enhanced plasma density, higher selectivity and increased process window especially for etching patterns with high aspect ratio.

Regarding Claims 3, 4, 20: Chen et al teach that second power generator 154 can operate at 13.56 MHz, and the third power generator 150 operates at 2 MHz (that is second power generator operates with at least three times an operational frequency of third power generator, as per claim 3 limitation) {paragraph 003}. Further Chen et al also teach that first power generator 162 is configured to operate at a frequency of 40-180 MHz, which is greater than frequencies of second and third power generators, as per claim 4 limitation (paragraph 0022).

Art Unit: 1763

Regarding Claims 5-9, 11: Tsuchiya et al teach all limitations of the claims including that apparatus (Figure 1) uses CPU (controller) 20 to control power supplies 18, 29 for ON/OFF (active /inactive) modes to optimize the etching parameters (column 9, lines 1-15 and column 12, lines 45-65 and column 13, lines 1-25). Tsuchiya et al further teach that etching parameters can be optimized by appropriately selecting the parameters including phase difference and the power ratio of the generators (column 8, lines 20-25).

Regarding Claims 13, 21: Chen et al teach that second power generator 154 can operate between 4 MHz to 60 MHz (for example 13.56 MHz) which is within the claimed frequency range of 13.5 MHz to 60 MHz, that is, the prior art anticipates the claimed frequency range (paragraph 0031).

Regarding Claims 12,18,19: Tsuchiya et al in view of Chen et al teach that first power generator 29 is capacitively coupled to upper electrode 21, and second and third power generators 150, 154 are capacitively coupled to lower electrode 120 (Tsuchiya et al - Figure 1 and Chen et al – Figure 1).

Regarding Claims 14,22: Chen et al teach that first power generator 162 can operate in the range of 40-180 MHz, which includes the claimed frequency range of 40 MHz to 100 MHz (paragraph 0022). It would be obvious to adjust the frequency of first power generator as per process limitations like size of substrate, type of gases used.

Regarding Claims 15,23: Chen et al teach that power generator 150 (third power generator) operates at a frequency of 2 MHz, which anticipates the claimed frequency range of 1 MHz to 13.5 MHz (paragraph 0033).

Conclusion

Applicant's amendment necessitated the new ground(s) of rejection presented in this Office action. Accordingly, **THIS ACTION IS MADE FINAL**. See MPEP § 706.07(a). Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire THREE MONTHS from the mailing date of this action. In the event a first reply is filed within TWO MONTHS of the mailing

Art Unit: 1763

date of this final action and the advisory action is not mailed until after the end of the THREE-MONTH shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than SIX MONTHS from the date of this final action.

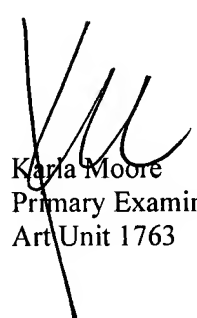
Any inquiry concerning this communication or earlier communications from the examiner should be directed to Rakesh K. Dhingra whose telephone number is (571)-272-5959. The examiner can normally be reached on 8:30 -6:00 (Monday - Friday).

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Parviz Hassanzadeh can be reached on (571)-272-1435. The fax phone number for the organization where this application or proceeding is assigned is 703-872-9306.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free)..



Rakesh K. Dhingra



Karla Moore
Primary Examiner
Art Unit 1763